

## SUBSCRIBERS' UNISELECTOR CIRCUITS

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### REFERENCES

Educational Pamphlets - Draft Series, Telephones 1/1

#### Introduction

The uniselector is used in the subscribers' line circuit to provide a calling subscriber with access to a free 1st Selector. Associated with each uniselector are two relays, used to control the operation of the uniselector.

#### *Non-Director Exchange*

The uniselectors used for subscribers' line circuits in non-director exchanges employing positive battery metering have four wipers in their assemblies, and the banks have four arcs. Three arcs, the private, positive and negative, have individual contacts but the fourth arc, termed the homing arc, has two solid parts insulated from each other. The homing arc is used to return the uniselector wiper assembly to the normal position at the end of each call.

#### *Director Exchange*

The uniselectors used for subscribers' line circuits in a director exchange differ from those used in non-director exchanges, since in director exchanges metering is effected by the application of a negative battery over a fourth wire between the subscribers' line circuit and the 1st Code Selector. This entails the use of five arcs - positive, negative, private, meter and homing, the latter having the same function as the homing arc of the four-arc uniselector.

In both types of exchange the uniselector banks have 25 contacts on each of the contact arcs. These contacts are numbered 0 to 24. Contact 0 is the resting or home contact on which the wipers stand when the uniselector is not in use. The remaining contacts of each uniselector are connected, together with corresponding contacts of other uniselectors, to the 1st Selectors.

#### Operation of subscriber's line circuit

#### *Positive Battery Metering*

Fig. 1 (appended) shows a subscriber's line circuit, the uniselector normal, i.e. on the home contact.

When the subscriber removes the handset from its cradle, the cradle springs in operating complete the loop of the subscriber's line and close the circuit for relay L. The circuit is completed via:-

Earth - contact K2 (normal) - subscriber's loop -  
contact K1 (Normal) - relay L - battery.

Relay L operates.

Contact L1 is designed to make before contact L2. This avoids the possibility of premature operation of relay K during the initial operation of L and also the incorrect switching of relay K to a busy outlet should the subscriber clear while the uniselector is hunting.

Contact L1 prepares the circuit for the operation of the driving magnet DM, at the same time placing a short circuit across relay K.

Contact L2 places a busying earth on the final selector multiple private to prevent intrusion by incoming calls and completes the circuit for the operation of the driving magnet DM thus:-

Earth - contact L2 (operated) - home contact of private arc -  
private wiper - contact L1 (operated) - contact K5 (normal)  
spring DM dm (normal) - magnet DM - battery.

Magnet DM operates.

When the driving magnet is fully operated its circuit is broken at the interrupter spring DM dm. As the uniselector mechanism is of the reverse action type, the wipers do not move until the driving magnet releases. When the driving magnet circuit is broken, the armature is returned to normal and the pawl engages with the teeth of the ratchet wheel, moving the wipers to the first contact.

The earth from the homing arc (DM1) now takes over the busying of the final selector multiple after the uniselector wipers have moved from the first contact.

On DM2 arc, engaged outlets are marked by an earth whilst the absence of earth marks a free condition. If an earth is encountered by the private wipers, the driving magnet circuit is again completed.

Earth on bank contact - private wiper - contact L1 (operated) -  
contact K5 (normal) - spring DM dm (normal) - magnet DM - battery.

The driving magnet DM operates again. When it is fully operated the interrupter springs operate and break the circuit to the driving magnet which releases and steps the wipers to the next contact.

This process is repeated each time an earth is encountered on the private bank contact, and continues until a disconnected, i.e. free, contact is reached when the driving magnet does not re-operate.

During the hunting by the uniselector for a bank contact without an earth on it, the earth extended to relay K by contact L2, and the earth on the home contact and other engaged private contacts, place a short-circuit across relay K and prevent its operation.

When the free contact is reached the short-circuit is removed from relay K, which operates over the following circuit:-

Earth - contact L2 (operated) - relay K -  
spring DM dm (normal) - magnet DM - battery.

At contact K1, the subscriber's negative line is connected to the negative wiper and the circuit for L relay is broken.

At contact K2, the subscriber's positive line is connected to the positive wiper and the operating earth for L relay is disconnected.

At contact K3, the holding circuit of relay K is prepared.

At contact K5, the operating circuit to the drive magnet is broken.

When the subscriber's loop is extended via the uniselector wipers and bank contacts to the first selector, the seizure of this selector causes an earth to be connected to the private wire. This earth is extended back to complete the holding circuit for relay K.

Earth on private wire from 1st selector - arc contact DM2 -  
wiper DM2 - contact K3 (operated) - relay K - spring DM dm -  
magnet DM - battery.

The driving magnet does not operate in series with relay K because of the high resistance of this relay.

Relay L is both slow to operate and slow to release.

The release lag ensures that the holding earth for relay K is not disconnected at contact L2 before the earth from the private wire holds relay K.

The operate lag allows the relay to be substantially fluxed before the uniselector commences hunting; this ensures that the full slow release time is always obtained, and is important should the uniselector switch to an early choice contact. When relay L releases, contact L1 prepares the homing circuit to restore the uniselector to the home position at the termination of the call. Contact L2 disconnects the earth from the K relay, (which is held operated to the earth on the private wire), and also from the home contact of arc DM1. While the uniselector wipers are off normal, wipers DM1 connect the two sides of this arc together to prepare the homing circuit.

The subscriber at this stage receives dial tone (from the 1st selector) and completes the call by dialling the number of the called subscriber.

When the called subscriber answers, the operation of relays in the final selector applies a 50V positive battery pulse to the private wire to operate the calling subscriber's meter.

The metering circuit, is as follows.

Positive battery on private wire - arc DM2 - private wiper -  
tag M - meter - rectifier -  
tag M1 - contact K4 (operated) - earth.

The subscriber's meter operates only to a positive battery pulse because the rectifier offers a high resistance to current from a negative battery.

When the calling subscriber clears by replacing the handset on its cradle, the loop is disconnected from the line and the final selector relays release. The guarding and holding earth is disconnected from the private wire, disconnecting the holding circuit of relay K in the subscriber's line circuit and allowing relay K to release.

Contacts K1 and K2 restore to normal in preparation for the next call made by the subscriber.

Contact K3 disconnects the circuit between the private wire and relay K to prevent relay K operating to an earth on any private contact during the subsequent rotation of the wipers.

Contact K4 disconnects the metering circuit to guard against operation of the subscriber's meter by a positive battery pulse on a private contact during homing of the wipers.

Contact K5 completes the drive magnet circuit.

Arcs DM1 are short-circuited by wiper DM1.

A circuit for magnet DM is made thus:-

Earth - arcs DM1 - contact L1 (normal)  
 contact K5 (normal) - spring DM dm - magnet DM - battery.

The drive magnet makes and breaks its own circuit at spring DM dm, stepping the wipers rapidly round until they rest on the home contact. As there is no earth on the home contact of arc DM1, the drive magnet is not energized when the wipers are in this position.

The subscriber's line circuit is now ready to re-operate as described above for the next call originated by the subscriber.

### *Incoming Call*

On a call incoming to the subscriber an earth is extended forward on the 'P' wire from the final selector. This causes the operation of relay K to the DM battery which at contacts K1 and K2 disconnect the L relay battery and earth from the line to prevent the final selector ringing current being prematurely tripped.

*Fourth wire negative battery metering*

Fig. 2 shows a subscriber's uniselect circuit designed for use in a director exchange. The circuit and operation are the same as that previously described, with the exception that the meter, which is operated by a negative battery, is connected to a separate meter wire instead of the P wire. For this reason there is no need for a rectifier as in the circuit considered earlier.

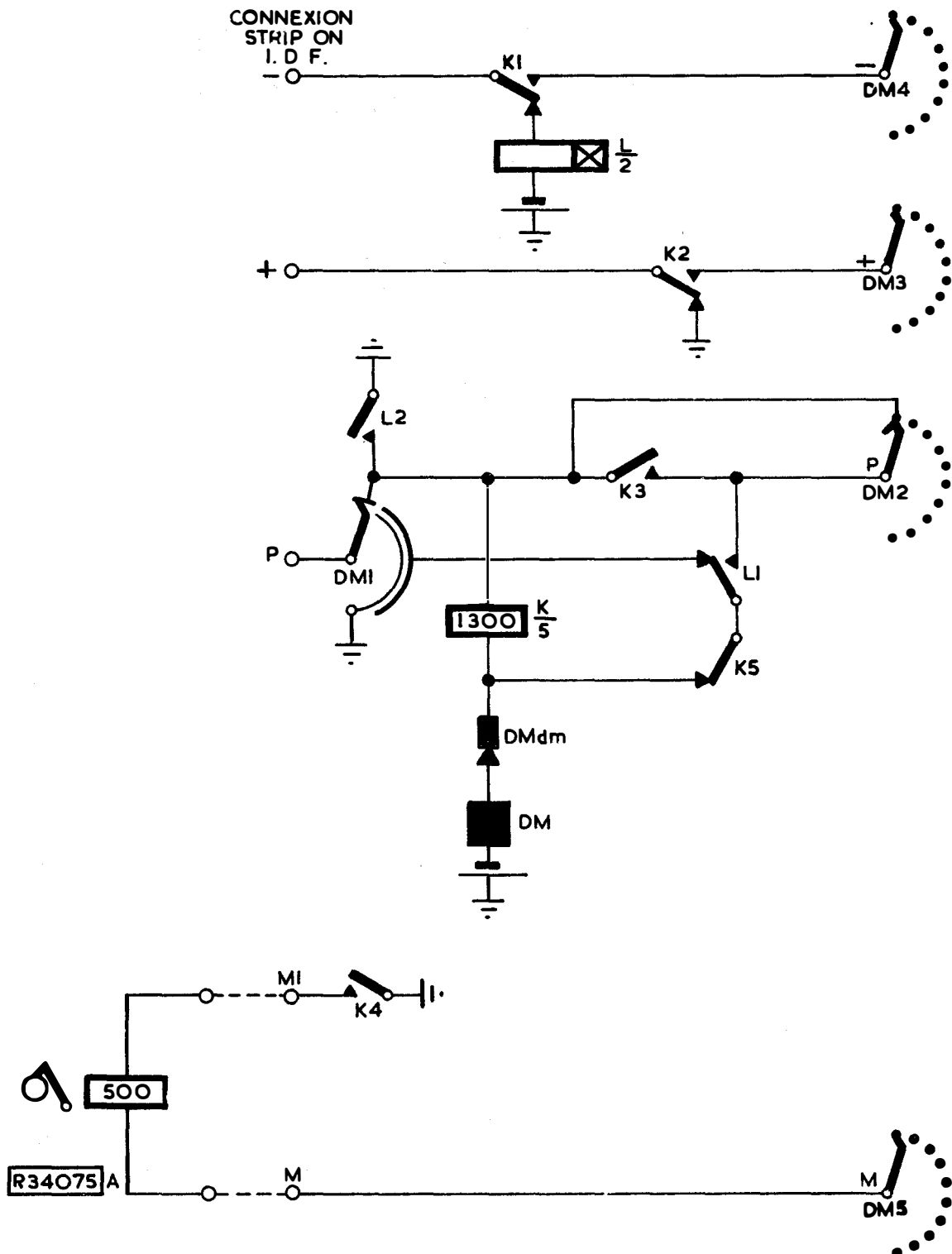


Fig. 2

*Two-home-position uniselector*

If the first choice selector is faulty in the arrangements previously described, a subscriber will be isolated during period of light traffic since each call originated by the subscriber will seize the faulty selector. The new standard line circuit overcomes this difficulty by using a "split" homing arc to give two home positions for the uniselectors. The connexions of the homing arc and P arc of the two-home-position subscriber's uniselectors are shown in Fig. 3.

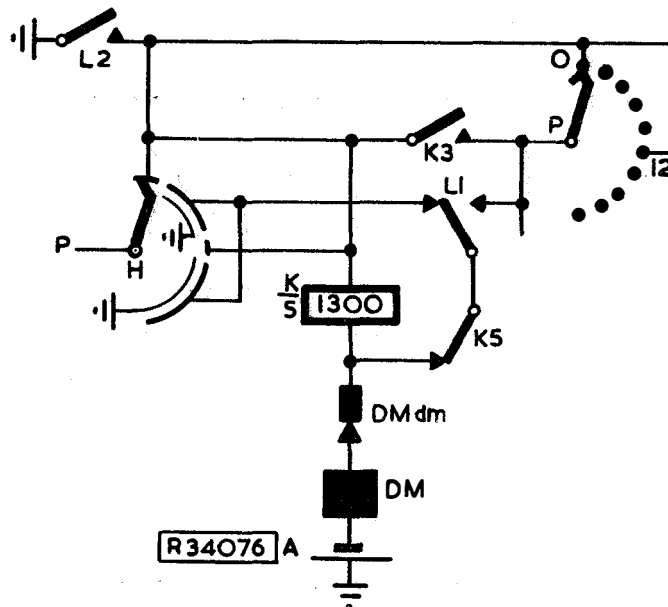


Fig. 3

The operation is similar to that of the previous circuit except that contacts O and 12 are wired as home contacts. On release from a call, the uniselector drives on to the next home position, the homing circuit being made via

Earth - homing arc - L1 contact (normal) - K5 contact (normal)  
spring DM dm - magnet DM - battery.

Thus alternate calls during a period of light traffic will seize different 1st selectors.

**Shared Service Working**

Shared service working is a method of providing telephone service to two subscribers by means of a common pair of wires over which signalling and speech currents are transmitted. Originally, shared service subscribers on automatic exchanges shared a common line and exchange equipment, but after a few years an additional facility of separate metering for each subscriber was introduced. A circuit description of the exchange equipment for both types of working will now be given.

*Common metering*

In this system the following facilities are provided:-

(a) Origination of calls by either subscriber, in the normal manner, using one exchange calling equipment and a single meter.

(b) Common metering, on the meter proper to the X subscriber's number, of all automatically registered calls originated by both subscribers.

(c) Allocation of a separate number to each subscriber, and the completion of incoming calls to either subscriber on an automatic basis, with selective ringing.

There is no secrecy between two sharing subscribers.

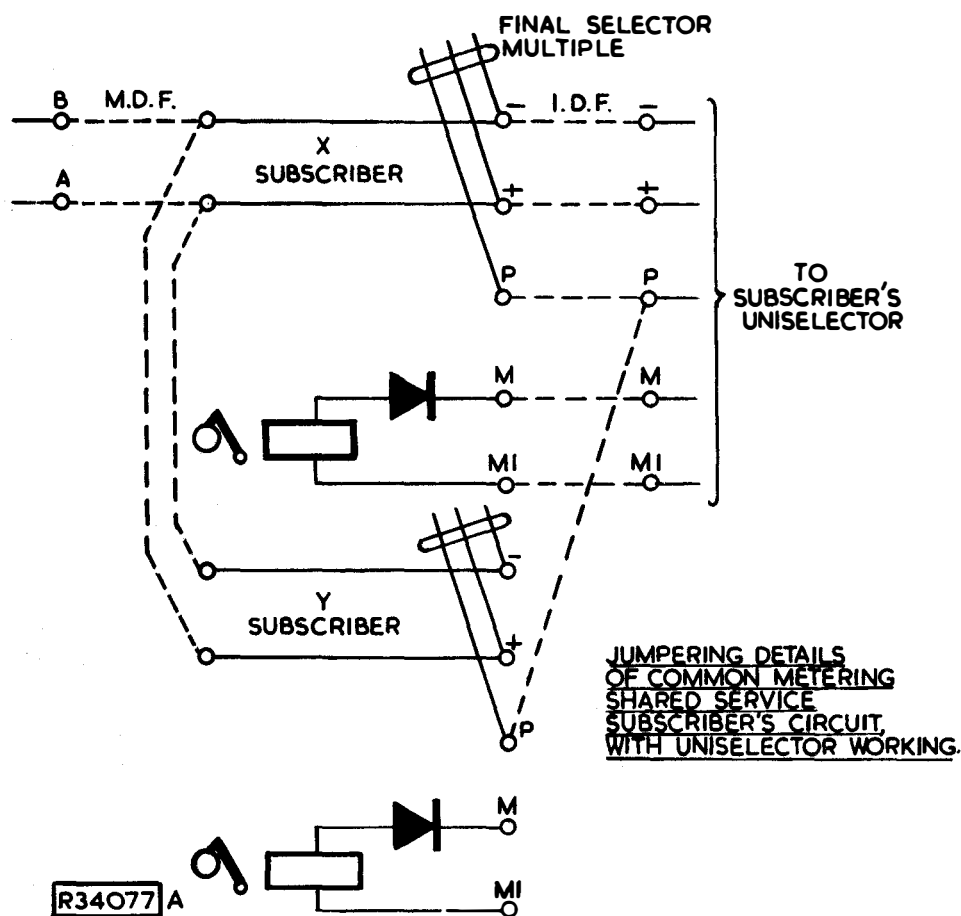


Fig. 4

Fig. 4 shows the jumper connexions on the M.D.F. and I.D.F. When originating a call, either subscriber extends a loop to operate relay L and the call proceeds in the normal manner.

An incoming call to subscriber X results in ringing current flowing from the negative wire of the final selector multiple cable via the subscriber's B wire, bell and capacitor to earth. An incoming call for subscriber Y results in ringing current flowing from the negative wire of the final selector multiple via the reversal jumper on the M.D.F., subscriber's A wire, bell and capacitor to earth.

### *Separate Metering*

The following facilities are provided:-

(a) Either subscriber originates a call by depressing a calling button on his telephone and lifting his handset.

(b) Each subscriber is allocated a separate calling equipment, separate meter and separate final selector number.

(c) Selective ringing is given on all incoming calls.

There is no secrecy between the two sharing subscribers.

Fig. 5 shows the jumper connexions on the M.D.F. and I.D.F., together with the relevant circuit elements of the line equipment for two sharing subscribers with separate metering. The calling signal received, when either subscriber makes a call, is an earth on the A or B wires depending on whether the call originates from the Y or X subscriber respectively. Consider a call originating from the X subscriber. On depression of the calling button, an earth is applied to the B wire to operate relay L in the line equipment.

Contact L1 prepares a circuit for the operation of the driving magnet DM, at the same time placing a short-circuit across relay K.

Contact L2 completes the circuit for the operation of the driving magnet and at the same time places a busying earth on the final selector multiple private, thus preventing intrusion from incoming calls for both X and Y subscribers. This earth will also operate relay K in the Y subscriber's line equipment and this relay remains held throughout the call.

The X subscriber's uniselector then hunts and seizes a free 1st selector. The Y subscriber's uniselector will not move off normal. The X subscriber's meter is operated in the normal manner when +ve battery is received over the P wire. It is impossible for the Y subscriber's meter to be operated under these conditions, since, although K4 is closed, the P wiper has not moved from normal to receive +ve battery.

When the Y subscriber originates a call, he depresses the button on his telephone which extends an earth out on the A wire of the line. This earth completes a circuit for the operation of relay L in the Y subscriber's circuit. The circuit for this is:- earth - subscriber's A wire, +ve wire on the M.D.F. and I.D.F., +ve wiper and home contact of the X subscriber's uniselector - K1 contact (Y subscriber's line equipment) - relay L to battery. Contacts L1 and L2 cause the Y subscriber's uniselector to hunt for and seize a free 1st selector, in an identical manner to that described when an X subscriber originates a call. The Y subscriber's meter is operated when the called subscriber answers (assuming the call to be directly dialled).



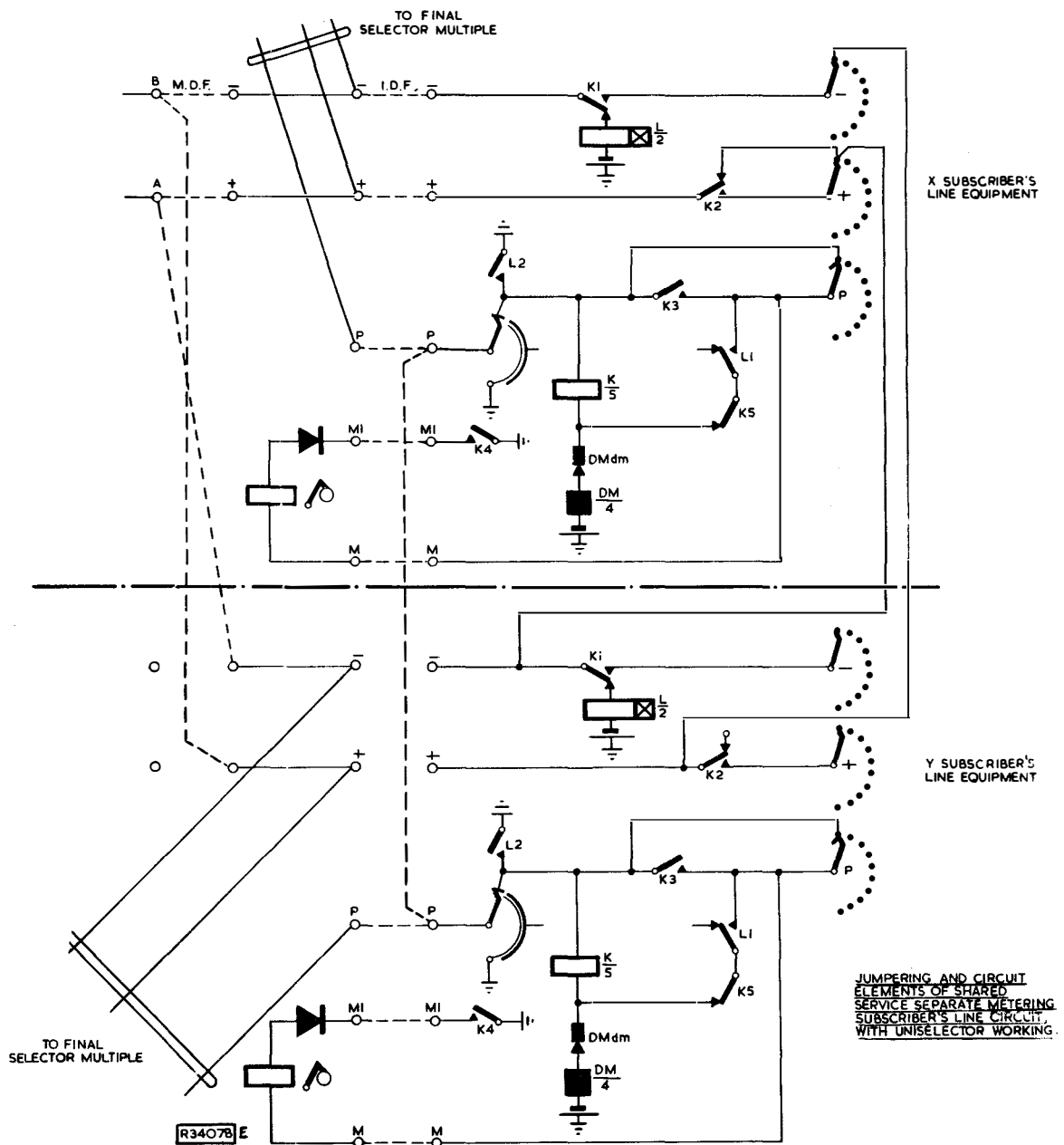


Fig. 5

An incoming call for the X subscriber is received in the normal manner, i.e. ringing current is fed out over the -ve wire of the final selector multiple, via the B wire and the X subscriber's bell and capacitor to earth. Similarly, for an incoming call to the Y subscriber, the ringing current is fed out over the -ve wire of the final selector multiple cable, through the reversal jumper on the M.D.F. to the A wire, and thence via the Y subscriber's bell and capacitor to earth.

A description of the shared service apparatus installed at the subscriber's premises is given in Educational Pamphlet - Draft Series, Telephones 1/1.

END

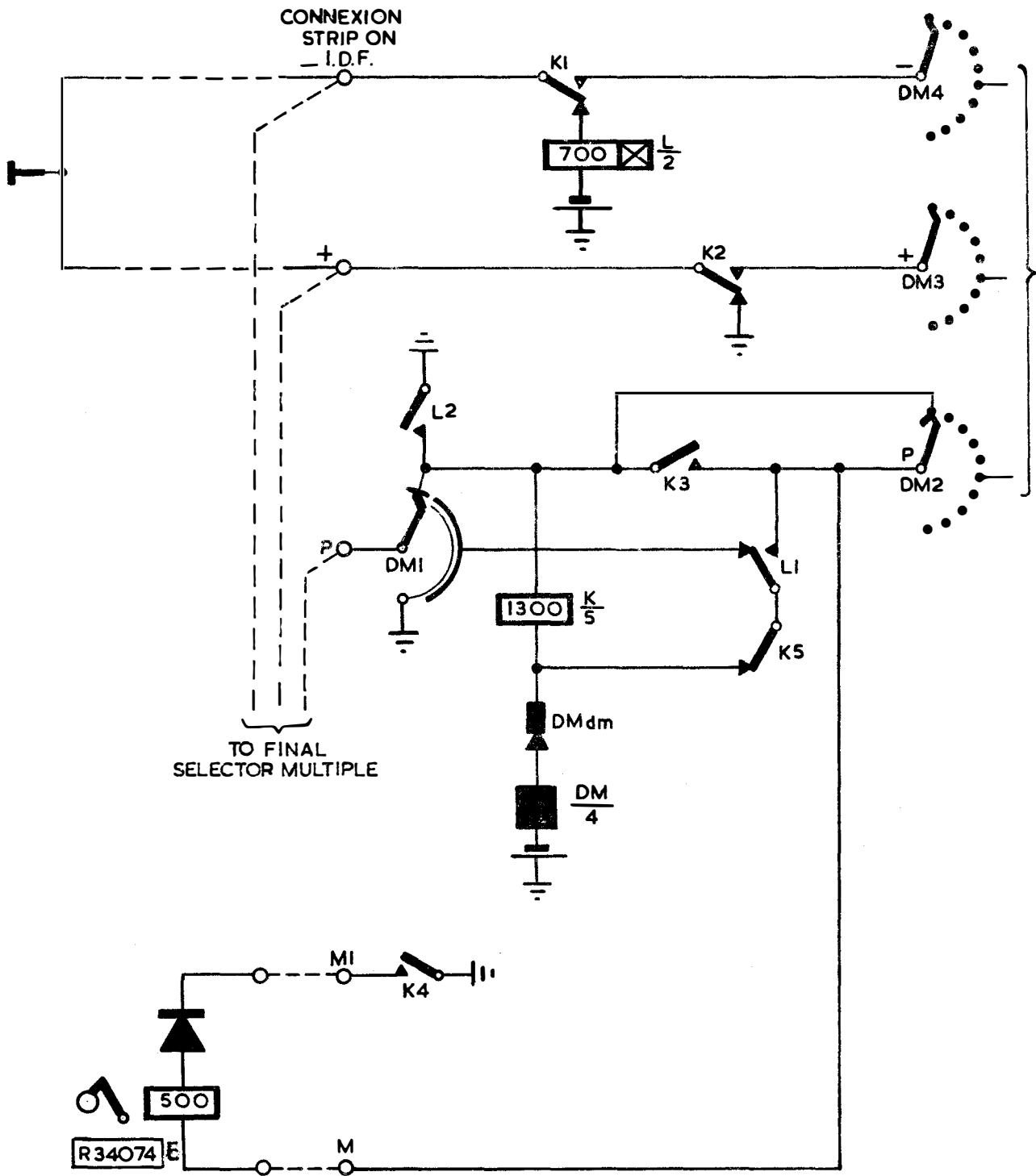


Fig. 1

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